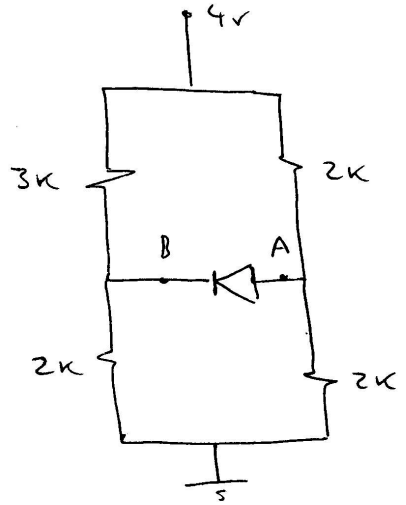
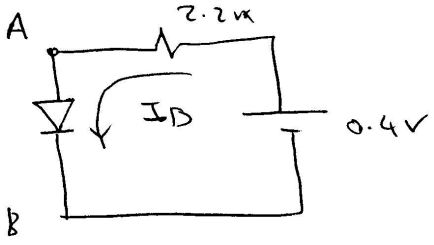


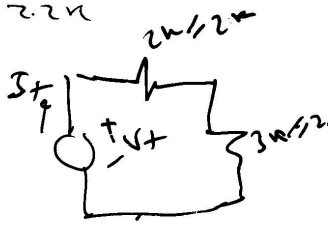
Find the Q-point for the shown diode using the ideal diode model and the CD model with $V_{D,on} = 0.6V$

* we first get the Thevenin equivalent between A&B

$V_{TH} = V_A - V_B = 4 * \frac{2}{4} - 4 * \frac{2}{5} = 2 - 1.6 = 0.4V$

$R_{TH} = 2K // 2K + 3K // 2K = 1K + 1.2K = 2.2K$

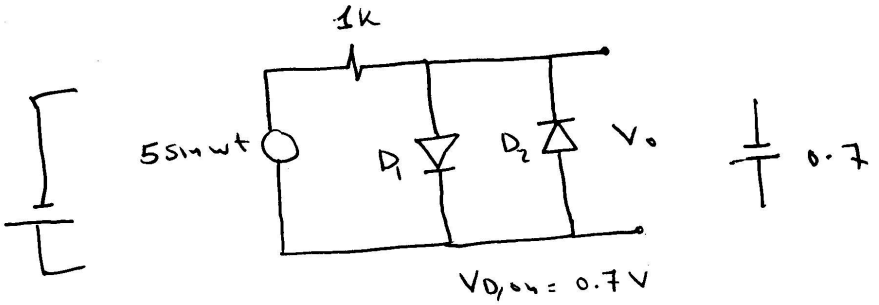




* Using ideal diode: Diode must be on and

$I_D = \frac{0.4}{2.2K} = 0.182mA \Rightarrow$ Q-point $(0, 0.182mA)$

* Using CD model $0.4 < V_{D,on} \Rightarrow$ Diode must be off $\Rightarrow$ Q-point $(0.4, 0)$



Express the output voltage as a function of the input voltage.

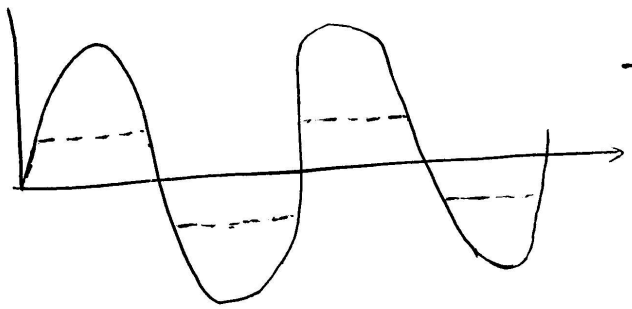
* If $V_i > V_{D,on}$, D_1 is forward biased and D_2 is reverse biased $\Rightarrow$ $V_o = V_{D,on_1} = 0.7V$

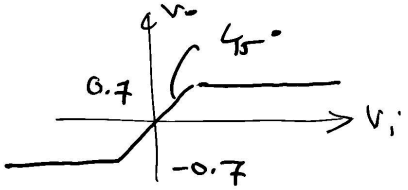
* If $V_i < -V_{D,on}$, D_1 is off, D_2 is on

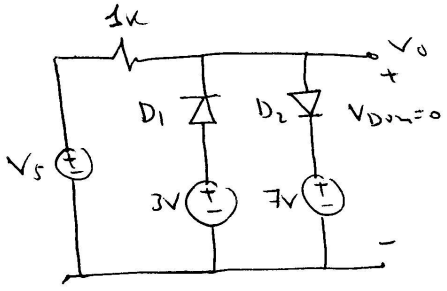
  $V_o = -V_{D,on} = -0.7V$

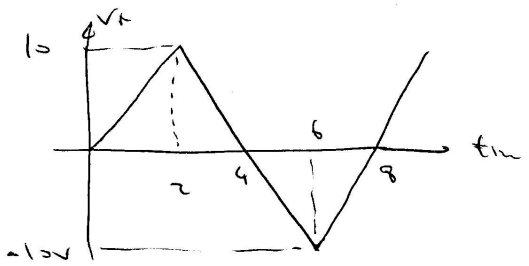
* If $-V_{D,on} < V_i < V_{D,on}$ both diodes are off

  and $V_o = V_i$









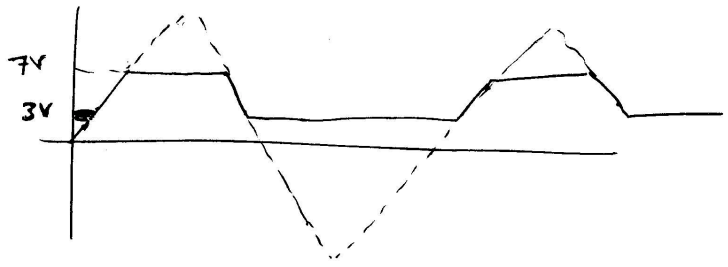
* Determine the output waveform corresponding to the shown triangular input?

* If $V_s \leq 3V$, D_1 is forward biased $\Rightarrow V_o = 3V$

* If $V_s \geq 7V$, D_2 is on $\Rightarrow V_o = 7V$

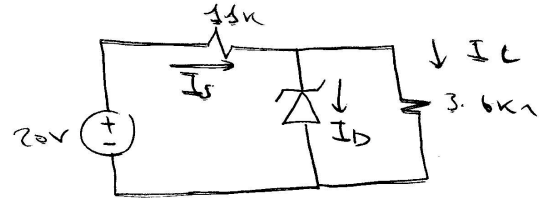
* If $3 < V_o < 7$ both diodes are off

$V_o = V_{in}$



(3)

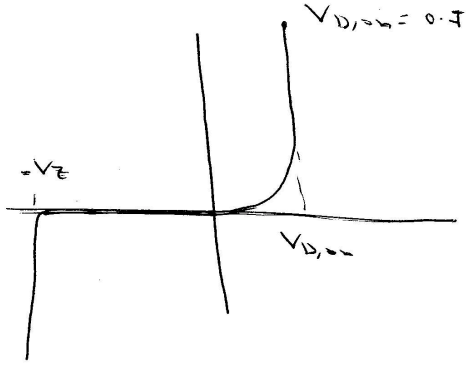
Find the Q point of the shown Zener diode circuit

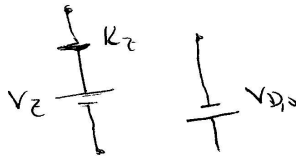


$V_Z = 4V$

$R_Z = 0$

$V_{D,on} = 0.7V$





* Diode cannot be in forward region because $V_D < 0$

* Assume that diode is in cut-off region

$I_S = I_L = \frac{20}{14.6k} = 1.369\,mA$

$\therefore V_L = I_L * 3.6k = 4.93$

but $V_L > V_Z \Rightarrow$ Diode must be in breakdown region (a contradiction)

$\therefore V_L = 4V \Rightarrow I_L = 1.11\,mA$, $I_S = \frac{20-4}{11k} = 1.45\,mA$

$I_D = I_S - I_L = 0.343\,mA \Rightarrow$ Q-point $(-4, -0.343mA)$